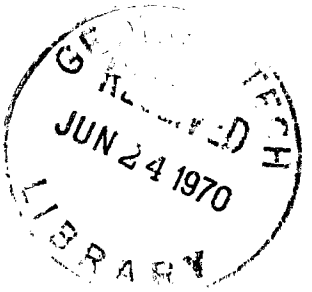
THE MARKET FOR COMMERCIAL FORGINGS IN THE SOUTHEAST AND THE POTENTIALS FOR FORGING FACILITIES IN GEORGIA



by Tze I. Chiang
INDUSTRIAL DEVELOPMENT DIVISION

Project E-400-200

1970

Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia

Project E-400-200

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Foreword

If there is any concentration in the Industrial Development Division's series of more than 100 studies of manufacturing opportunities in the state and region, it is in two somewhat unrelated areas: wood products and metal products and metalworking. Emphasis on the former stems from an appreciation of the state's abundant forest resources, and interest in the latter is keyed to a recognition of the large and growing industrial and consumer markets in Georgia and the Southeast.

This study continues the Division's probe of development potentials in the metal products and metalworking industry. It examines the feasibility of establishing additional metal forging facilities in the state -- the first of 29 fabricating opportunities identified in Steelmaking and Steel Fabricating Potentials in Georgia and the Southeast, published by the Industrial Development Division in May 1969.

The interest generated by last year's comprehensive report of steelmaking and steel fabricating potentials prompted the initiation of this more precisely focused study of what appears to be an unusual opportunity for further development of the state's metalworking industry. Reaction to this report will influence the priority of future follow-up studies in this field. Your comments and suggestions, therefore, are earnestly solicited.

Ross W. Hammond, Chief
Industrial Development Division
GEORGIA INSTITUTE OF TECHNOLOGY

Acknowledgments

The author wishes to express his appreciation to several persons who provided assistance in the preparation of this study. Mr. George W. Weinfurtner of the Forging Industry Association reviewed the manuscript of this report and made many pertinent comments. He also suggested several questions to be included in a questionnaire which was used in a survey of the forging market in the Southeast. Mr. R. W. Atkinson, executive vice president of the association, sent several publications as well as statistical data concerning the forging market.

Acknowledgment also should be made of the assistance of Mr. David W. Veit, publisher of Precision Metal, who reviewed the draft of this report and provided advance data from the "Annual Forging Directory." Mr. Ike Birch of the Georgetown Steel Corporation provided assistance in selecting major forging using industries to be used in the survey. He also reviewed the survey questionnaire. Thanks are due as well to many current and potential forging users in the Southeast who responded enthusiastically to a mail survey conducted last year.

Summary

The rapidly growing metalworking complex in the six-state Southeast consumes a much larger volume of forgings than it produces, and Georgia's central position in the area makes it an excellent location for new forging facilities to help bridge the widening gap between supply and demand. Of the $46 million worth of metal forgings consumed in the Southeast in 1969, most was shipped in from outside the area. Only nine commercial forgers are located in the region.

A survey reveals that companies in the six states of Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee consumed about $46 million of metal forgings in 1969. They anticipate an annual increase in consumption of $4.6 million or about 10% of the yearly total. Of the $46 million consumed, $19 million was in carbon steel forgings, $15.8 million in alloy steel forgings, and $11.2 million in nonferrous forgings. Captive supplies constituted 17% of total consumption or about $8 million. Closed impression die forgings comprised about 66% of the total or $30 million, while open die forgings amounted to about 34% of the total or $15.8 million. Annual consumption of forgings together with competing materials, such as castings, weldments, stampings, and powder metal parts, in the six-state area was in the neighborhood of $131.5 million or about 285% of forging consumption alone.

Forgings used in the six-state area came largely from Ohio, California, Pennsylvania, Massachusetts, Indiana, Illinois, Tennessee, Alabama, and Michigan. About one-fourth of the forging consumers in the area indicated that they would increase their forging purchases if a new source of supply were located nearby.

Major end uses of forgings in the area are (1) fabricated plate work (boiler shops), (2) aircraft parts and auxiliary equipment, (3) metal stampings, (4) farm machinery and equipment, (5) motor vehicle parts and accessories, (6) aircraft, (7) guns, howitzers, motors, and related equipment, and (8) guided missiles and space vehicles.

Of the $46 million consumed in the area, Alabama's share was $12 million, Florida's was $9 million, Georgia's $8 million, North Carolina's $2 million, South Carolina's $3 million, and Tennessee's $12 million. Anticipated annual growth varied in each state -- Alabama, 12%; Florida, 10%; Georgia, 17%; North Carolina, 5%; South Carolina, 14%; and Tennessee, 3%.

According to the 1967 Census of Manufactures, the U. S. value of shipments of all forgings (including interplant transfer) increased from $786 million in 1958 to $1,620 million in 1967, an annual growth of 8.4%. Based on shipments reported by the Forging Industry Association, closed impression die forging sales increased from $636 million in 1959 to $1,067 million in 1968, representing a 5.9% annual growth. Sales to the aircraft and missiles industry amounted to 31.6% of the 1968 total, those to the automotive industry to 20.3%, ordnance to 11.6%, and off-highway equipment to 11.3%. These four major end uses constituted about three-quarters of the U. S. closed impression die forging sales in 1968.

The market for forgings will continue to grow because of increasing demand for high-strength and stress-resistant parts for modern machines and vehicles. The value of shipments of all forgings is projected to reach $1,789.7 million in 1970 and $2,217.6 million in 1975.

Forging facilities in the United States are highly concentrated in Ohio, Illinois, Wisconsin, California, Texas, Pennsylvania, Massachusetts, and New York. Of nearly 400 commercial forgers in the nation, only nine are located in the six-state Southeast. Forging capability in the Southeast in terms of average maximum weight of a single forging constitutes less than 1% of the nation's. The forging capacity in the Southeast is too small to meet the regional demand for forgings.

Historically, growth of the forging industry has paralleled the general industrial expansion in the United States. In the last decade, the metalworking industries in the six-state Southeast have grown at a rate three times that of the nation, and the market for forgings should rise proportionally with the growth of the metalworking industries in the area. As time goes on, the demand-supply gap will increase in the Southeast because of the faster growth of the forging market in the area than in the nation.

Georgia's central location in the Southeast with Atlanta as the hub of commercial, transportation, and distributing activities offers a tremendous opportunity for the development of new forging facilities to serve the region. A new forging plant locating in Georgia will enjoy such major advantages as close coordination with potential customers in the area, shorter delivery time, freight savings, lower labor cost, and wider choice in plant location.

INTRODUCTION

Three years ago, the Industrial Development Division made a survey of metal forging consumption in the Southeast for a potential investor in Georgia. That study revealed the need for additional commercial forging facilities in the area. Although the prospective investment did not materialize, the potential for such a manufacturing operation not only still exists, but also is even greater today. The purpose of this study is to spotlight the opportunity in commercial forgings offered in Georgia and its neighboring states.

The study presents detailed data on forging consumption in the six states of Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee -- a natural market for most Georgia-based manufacturing. It also offers a brief review of several aspects of the forging industry. The report is organized into four main sections. The first part provides a background review of the industry, discussing product definition and basic forging classifications, historical development, plant locations and capacities, and marketing practices. The second part deals with the national trends of the forging market by metal type, by forging process, and by end use. Also included are projections for these market outlets.

The forging market in the six-state area and in each individual state is presented in part three. Two series of data are offered on forging consumption by metal type and by process, captive supplies, anticipated annual increase, and annual consumption of forgings and their competing materials. One is based on "enumerated total" and the other on "estimated total." Additional information concerning end uses, major supplying states, and possible increased forging consumption due to a new source of supply nearby also is supplied. Part four of this study points out the need for additional forging facilities in the Southeast. Included are the supply deficit, the growth of the metalworking industry in the six-state Southeast, and Georgia's potential as a location for new forging facilities.

The major portion of this report is based on a market survey of prospective forging consumers in the Southeast. Over 1,800 questionnaires were mailed, and 58% were completed and returned -- a high rate of response. Useful data also were obtained from trade associations and journals.

THE FORGING INDUSTRY

Definition and Basic Forging Classifications

The Forging Industry Association defines and describes forging as follows:

> Technically, forging may be defined as the process of giving metal increased utility by shaping it, refining it, and improving its mechanical properties through controlled plastic deformation under impact or pressure. But the true meaning of forging can be more clearly recognized by considering the variety of ways it serves mankind and the important characteristics forged parts offer those who design, purchase, and use them.
>
> Forgings are commonly found in machines and conveyances at critical points of shock or stress -- particularly where reliability and human safety are affected. And yet the great variety of shapes, sizes, and properties available in forgings has extended the list of current applications and potential future uses far beyond this point.[1/]

Forgings embody several favorable characteristics, and the selection of a forging for a particular application is usually based on one or more of the following reasons:

1. Great reliability for strength.
2. Superior physical characteristics, especially fatigue and stress resistance.
3. Uniform grain flow.
4. A high strength to weight ratio.
5. Minimum of machining and finishing operations required.
6. Savings in materials because forged parts are produced close to required dimensions and contours.

Forged parts can be produced with a wide range of equipment and techniques, but they fall into only two general classifications -- closed die forgings and open die forgings. Closed die forgings are also termed impression die forgings, which include drop, upset, and press forgings. An impression die forging is formed to the required shape and size by machined impressions in a specially prepared die which exerts three-dimensional control on the workpiece. Producers of impression die forgings use various types of equipment to produce quantities of uniform components in dies containing precisely engineered impressions of the piece to be forged. Metal flow is rigidly controlled to assure optimum

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1/ Forging Industry Handbook, Forging Industry Association, Cleveland, Ohio, 1966.

mechanical properties in critical sections of the piece. Relatively little machining is required in the finishing stage.

An open die forging, also known as a flat die forging, is formed between flat or simple contour dies by repeated strokes and manipulation of the workpiece. It also is termed "hand" or "smith" forging. Producers of open die forgings typically use heavy equipment to work heated stock into relatively large, symmetrical shapes between simple, smooth-surfaced dies. The process is used for production of large-size forgings in small quantities. Machining is generally required in finishing.

Materials used in forgings are classified as ferrous and nonferrous. Ferrous metals include carbon steel, common alloy steel, and stainless steel, while nonferrous metals include aluminum, titanium, copper, brass, bronze, magnesium, and zirconium. Advances in forging technology in recent years have broadened the range of metals and alloys which can be used in forgings. The "forgeability" of a metal or alloy determines to a large extent the selection of the forging process used.

An Historical View[1/]

From the historical point of view, an interrelationship exists between forging and the growth of the industrial world. The early development of the drop forging industry corresponds closely with the industrial revolution in England, which began about 1760. Samuel Colt set up the first drop forging plant in the United States to manufacture guns in Hartford, Connecticut, around 1857. Through the years, forge shops grew in size and heavier hammers came into use. Parts used in saddle and wagon manufacturing were regularly made in forge shops. In England, forging became an important method of making bicycle parts. Thus, a marriage between the forging and transportation industries started. Drop forged parts included levers, eye bolts, tie rods, ball cranks, and many similar items.

The demand for weapons, the explosive growth of the transportation industry, the mass movement of people into farmlands, and the widening use of steam

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1/ For a detailed discussion of the historical development of the forging industry, see "Drop Forgings: From Wagons to Space Vehicles," by Philip R. Kalischer, Precision Metal, September 1968.

power created a market for precisely made machine parts of superior strength in the United States. Forgings were a factor in the commercial development and expanded use of the combustion engine, spinning and weaving machines, railroad cars, automobiles, and finally aircraft between 1880 and 1910. Bigger and better-controlled steam and air hammers were developed and a few hydraulic presses were built in this period.

War demands between 1910 and 1920 brought about mass production of forged parts for weapons. During this period, the American automotive industry expanded greatly, resulting in a parallel increase in the use of forgings. Between 1920 and 1940, the forging industry benefited from the growth of the appliance industry and the mechanization of farming methods. Out of World War II and the Korean conflict came large press forgings of magnesium and forgings of the high-temperature, high-strength alloys.

Current developments in the aerospace field -- supersonic aircraft, missiles, and space vehicles -- offer an unexcelled opportunity to the forging industry. Much larger impression dies than existing ones are needed. The aircraft and space industry has become the most important market outlet for forgings today. Other exciting markets for forgings are in sight, such as in oceanography and in desalinization of salt water. Based on the historical trend, the forging industry no doubt will continue to play an important role in the future development of the industrial world.

Plant Locations and Capacities

The distribution of commercial forging facilities, according to trade sources, is highly concentrated in the East North Central region, especially in Ohio, Illinois, and Wisconsin. To a lesser extent, California and Texas also are important. However, no statistical data are available to show the geographical distribution of forging production capability in the United States.

The number of forging companies in each region and in each state is one indication of the distribution, even though it may not be precise. According to trade sources, there are about 900 metal forgers in the nation. One-half of them are captive operations and the other half are for commercial sales. Of the estimated 450 commercial forgers in the nation, 50 to 75 are so-called "catalog forgers" who mass produce standardized items and sell them through catalog mailings. The remaining 375 to 400 commercial forgers, whose business

depends mainly on individual orders through competitive bidding, are the backbone of the commercial forging industry. Throughout this report, the terms "commercial forging" and "commercial forgers" refer to this group, which is the focus of attention in this study.

Two information sources give some indication of the distribution of commercial forgers in the nation. The "Annual Forging Directory," based on a survey of commercial forgers in the United States and Canada conducted by Precision Metal, a magazine specializing in forging and other metallurgical processes, lists individual forging companies, plant location, type of metal forged, type of forging process, and maximum weight of a single forging for each company. The other source is the recently published "1970 Forging Capability Chart" of the Forging Industry Association, which gives member companies, their addresses, major forging equipment, and minimum and maximum weight of forgings produced.

A tabulation of data supplied by Precision Metal is presented in this section. The distribution of commercial forging companies in the nation is given in Tables 1 and 2 in terms of the number of companies and average maximum weight of a single forging by metal type, by region, and by state. According to Precision Metal, the number of companies responding to its survey and included in the tables represent about 80% of the commercial forgers in the United States. The average maximum weight of a single forging given in the tables was derived by adding up the maximum weights of single forgings given for individual companies and dividing this sum by the number of companies involved. It should be observed that neither the number of companies nor the average maximum weight of a single forging listed for each state can truly reflect its forging production capabilities. However, these figures do give some rough idea of where the commercial forging facilities are.

Closed die commercial forging capacity is heavily concentrated in the Middle Atlantic, East North Central, Pacific, and New England regions. Of the 274 commercial closed die forging operations in the country that responded to the survey, 176 produce forgings of carbon and low-alloy steels, 111 use stainless and high-alloy steels, 67 use aluminum, and lesser numbers use copper/brass/bronze, magnesium, titanium, super alloys, and zirconium. Details are given in Table 1.

Table 1

CLOSED DIE FORGINGS: NUMBER OF COMPANIES, TYPES OF METAL FORGED, AND AVERAGE MAXIMUM WEIGHT OF A SINGLE FORGING, BY REGION AND BY STATE, THE UNITED STATES, 1970

Region and State[1/]	A		B		C		D		E		F		G		Z	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
New England	14	3,628	10	5,027	10	768	13	600	2	2,030	4	2,526	5	5,013	-	-
Maine	1	95	-	-	-	-	1	20	-	-	-	-	-	-	-	-
New Hampshire	1	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Massachusetts	8	6,314	8	6,268	6	1,263	7	1,093	1	5,000	3	3,342	4	6,260	-	-
Connecticut	4	44	2	50	4	24	5	24	1	60	1	80	1	25	-	-
Middle Atlantic	37	2,995	27	4,017	16	708	15	148	2	7	12	2,643	10	2,178	-	-
New York	11	40	9	29	6	13	4	49	1	4	4	14	3	22	-	-
New Jersey	1	500	1	400	1	400	1	500	-	-	1	300	1	300	-	-
Pennsylvania	25	4,395	17	6,341	9	1,205	10	153	1	10	7	4,480	6	3,568	-	-
East North Central	74	122	40	124	21	40	16	91	1	40	9	89	8	107	-	-
Ohio	29	98	19	107	11	57	10	133	-	-	4	57	2	137	-	-
Indiana	4	30	3	27	3	4	1	10	1	40	1	20	-	-	-	-
Illinois	18	259	11	251	3	47	1	3	-	-	3	179	3	178	-	-
Michigan	19	46	6	8	4	14	3	37	-	-	1	10	2	6	-	-
Wisconsin	4	127	1	30	-	-	1	10	-	-	-	-	1	30	-	-
West North Central	6	8	3	5	2	11	2	4	-	-	-	-	-	-	-	-
Minnesota	2	12	1	3	-	-	1	5	-	-	-	-	-	-	-	-
Iowa	2	6	1	7	-	-	-	-	-	-	-	-	-	-	-	-
Missouri	1	6	1	6	2	11	1	4	-	-	-	-	-	-	-	-
Kansas	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Atlantic	4	11	2	16	-	-	1	3	-	-	-	-	-	-	-	-
West Virginia	1	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Carolina	1	6	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Georgia	1	30	1	30	-	-	-	-	-	-	-	-	-	-	-	-
Florida	1	10	-	-	-	-	1	3	-	-	-	-	-	-	-	-
East South Central	4	34	1	11	-	-	1	11	-	-	-	-	-	-	-	-
Tennessee	3	17	1	11	-	-	1	11	-	-	-	-	-	-	-	-
Alabama	1	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West South Central	9	5,020	8	4,974	3	56	2	95	-	-	3	4,687	3	4,693	-	-
Texas	9	5,020	8	4,974	3	56	2	95	-	-	3	4,687	3	4,693	-	-
Mountain	4	97	2	50	1	100	1	100	1	250	1	100	-	-	-	-
Colorado	2	67	1	4	-	-	-	-	-	-	-	-	-	-	-	-
Utah	1	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nevada	1	250	1	100	1	100	1	100	1	250	1	100	-	-	-	-
Pacific	24	10,516	18	2,871	14	1,757	8	6,299	3	65	11	47	9	44	1	100
Oregon	2	400	2	300	1	50	-	-	-	-	1	25	-	-	-	-
California	22	11,436	16	3,192	13	1,888	8	6,299	3	65	10	49	9	44	1	100
United States	176	2,664	111	2,300	67	668	59	1,072	9	590	40	1,436	35	1,779	1	100

* = Less than one pound.
a = Number of companies.
b = Average maximum weight in pounds of a single forging.

Types of metal forged: A = Carbon and low-alloy steel; B = Stainless and high-alloy steel; C = Aluminum; D = Copper, brass, bronze; E = Magnesium; F = Titanium; G = Super alloys; Z = Zirconium

Note: The total number of responding commercial closed die forgers in the U. S. is 274. Source: Tabulated from data supplied by Precision Metal, Cleveland, Ohio.

1/ Plants also are located in Arkansas, Kentucky, and Washington, but these states are not listed because maximum weight was not available for any of the plants therein. In all states, only the number of plants giving maximum weight data are shown.

Table 2

OPEN DIE FORGINGS: NUMBER OF COMPANIES, TYPES OF METAL FORGED, AND AVERAGE MAXIMUM WEIGHT OF A SINGLE FORGING, BY REGION AND BY STATE, THE UNITED STATES, 1970

Region and State[1]	A		B		C		D		E		F		G		Z	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
New England	4	12,772	2	15,500	3	3,700	2	5,500	2	5,050	2	15,500	1	30,000	-	-
Massachusetts	3	17,000	2	15,500	2	5,500	2	5,500	1	10,000	2	15,500	1	30,000	-	-
Connecticut	1	87	-	-	1	100	-	-	1	100	-	-	-	-	-	-
Middle Atlantic	26	56,576	22	24,130	8	4,200	11	1,800	2	5,200	9	6,016	10	3,435	-	-
New York	4	1,575	5	25,860	4	7,250	5	240	1	400	2	350	2	450	-	-
New Jersey	4	1,489	4	1,213	2	1,750	2	1,500	-	-	1	750	1	750	-	-
Pennsylvania	18	81,040	13	30,513	2	550	4	3,902	1	10,000	6	9,617	7	4,671	-	-
East North Central	42	7,229	29	2,885	2	500	7	561	-	-	4	2,000	5	5,440	-	-
Ohio	29	4,038	19	860	-	-	2	162	-	-	2	3,150	2	3,150		
Illinois	7	25,359	5	11,820	2	500	2	500	-	-	2	850	3	6,967	-	-
Michigan	5	1,800	5	1,650	-	-	3	867	-	-	-	-	-	-	-	-
Wisconsin	1	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West North Central	2	49	1	80	-	-	-	-	-	-	-	-	-	-	-	-
Iowa	1	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Missouri	1	80	1	80	-	-	-	-	-	-	-	-	-	-	-	-
South Atlantic	1	1,500	1	100	-	-	1	400	-	-	-	-	-	-	-	-
West Virginia	1	1,500	1	100	-	-	1	400	-	-	-	-	-	-	-	-
East South Central	2	310	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tennessee	2	310	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West South Central	8	5,810	6	4,200	3	3,053	3	2,067	-	-	1	100	3	2,050	-	-
Oklahoma	2	4,000	2	3,000	1	3,000	2	3,000	-	-	-	-	1	1,000	-	-
Texas	6	6,413	4	4,800	2	3,080	1	200	-	-	1	100	2	2,575	-	-
Pacific	13	25,342	10	17,139	6	4,950	5	11,600	3	500	6	2,102	5	1,024	1	100
Washington	1	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oregon	2	575	2	175	-	-	-	-	-	-	-	-	-	-	-	-
California	10	32,804	8	21,370	6	4,950	5	11,600	3	500	6	2,102	5	1,024	1	100
United States	98	22,488	71	11,863	22	3,844	29	2,000	7	3,143	22	4,812	24	4,284	1	100

a = Number of companies.
b = Average maximum weight in pounds of a single forging.

Types of metal forged: A = Carbon and low-alloy steel; B = Stainless and high-alloy steel; C = Aluminum; D = Copper, brass, bronze; E = Magnesium; F = Titanium; G = Super alloys; Z = Zirconium

Note: The total number of responding commercial open die forgers in the U. S. is 114.

Source: Tabulated from data supplied by Precision Metal, Cleveland, Ohio.

1/ A plant also is located in Louisiana, but this state is not listed because the maximum weight was not available. In all states, only the number of plants giving maximum weight data are shown.

For commercial open die forgings, the Middle Atlantic, East North Central, Pacific, and West South Central regions are the major producing areas. Of the 114 companies engaged in commercial open die forging, 98 produce carbon and low-alloy steel forgings, 71 stainless and high-alloy steel, and lesser numbers the other types. Details are given in Table 2.

The distribution of commercial forging companies in the United States is shown on Map 1, on the following page, which indicates the number of commercial forging companies, both closed impression die and open die, in each state.

Marketing Practices

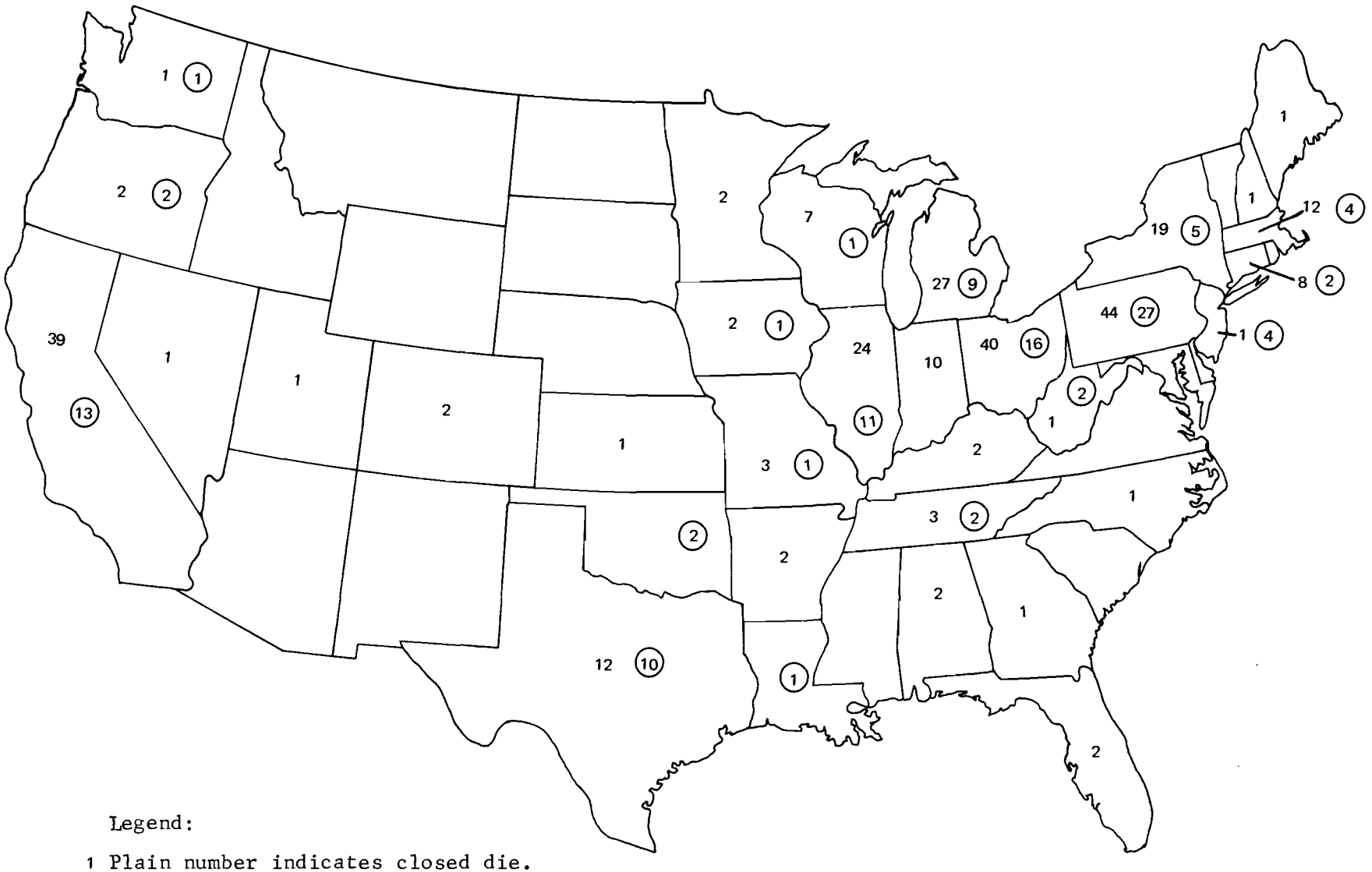
Commercial forgings generally are purchased on the basis of competitive quotations. The terms and conditions covering the sale of forgings are the product of individual negotiations between buyer and seller. Forging buyers make important product decisions such as material selection, the degree of precision to be required, configuration of the component, heat treating, and other post-forging requirements. On the other hand, forging sellers may advise their customers on any modifications in the different stages of engineering, design, production, heat treating, and finishing which would be economically and technically advantageous.

The terms and conditions under which quotations are made in the forging industry include acceptance, arbitration of claims, cancellation, credit, deferred deliveries, delays, government regulations, machine finish, patent infringement, payment, prices, quantity tolerances, preparation charges, storage, packing, special services, taxes, waivers, alterations and modifications, warranty, limits of warranty, and claims. As in the marketing of most products, quality of the product made and service rendered, price, and delivery time are the most important factors in winning customers.

Forging companies compete for potential customers not only among themselves, but also with firms manufacturing similar products, such as castings, weldments, stampings, and powder metal parts. Aggressive forging companies usually send engineering sales personnel out to scout sales opportunities. Success in the forging business requires working closely with buyers, dependability in meeting delivery schedules, strict quality control on the products made, realistic scheduling of production, competitive pricing, and positive thinking

Map 1

NUMBER OF COMMERCIAL CLOSED DIE AND OPEN DIE FORGING PLANTS, BY STATE, IN THE UNITED STATES, 1970



Legend:

1 Plain number indicates closed die.
(1) Number with circle indicates open die.

Source: Precision Metal

Note: Figures include only those plants responding to Precision Metal's annual survey, which represent about 80% of the commercial forgers in the U. S.

in handling difficult bidding situations or in dealing with opinions advanced by buying engineers.[1/]

1/ "How to Be a Favored Forging Vendor," Precision Metal, November 1969.

THE NATIONAL TRENDS OF THE FORGING MARKET

Market Outlets by Metal Type

The forging industry has been growing at a comfortable rate over the past dozen years. Census Bureau statistics show that between 1958 and 1967 the value of shipments (both commercial sales and interplant transfers) of all forgings rose on an average of 8.4% a year, while the Forging Industry Association reports an increase in commercial sales of all closed die forgings of 5.9% a year during the 1959-1968 period. Since the sets of data from the two sources are organized differently, they will be presented separately here, with no attempt at correlation.[1/]

Census Bureau Data. As shown in Table 3, between 1958 and 1967 the number of forging establishments in the United States declined slightly from 330 to 312, employment rose 23% from 42,300 to 51,900, and the value of shipments more than doubled from $786 million to $1,620.1 million. This indicates an increase both in size of operating unit and in productivity per employee. The growth in value of shipments averaged 8.4% annually.

The nonferrous segment of the industry grew much faster over the period than did the ferrous group, registering a 270% increase in value of shipments compared with 82% for iron and steel forgings. This faster rate of growth was due largely to the rapid expansion of the aerospace industry in the United States. However, iron and steel forgings still constitute the vast majority of forgings produced.

1/ Two major sources of forging market data are available. The U. S. Bureau of the Census includes forging statistics in the Census of Manufactures and Current Industrial Reports, and the Forging Industry Association has been publishing an Annual Report of Commercial Forging Sales since 1959. However, these two sources are not consistent with each other. Government data include both shipments for sale to others and for interplant transfer, while data from the association concern commercial sales only. In addition, the association reports only on closed die forgings, while the government sources include all processes. Data from both sources are presented in this section for comparison purposes.

Table 3

FORGING STATISTICS: ESTABLISHMENTS, EMPLOYEES, AND VALUE OF SHIPMENTS IN THE UNITED STATES, 1958-1967

Year	Iron and Steel Forgings			Nonferrous Forgings			All Forgings		
	Total Establishments (No.)	All Employees (1,000)	Value of Shipments ($ million)	Total Establishments (No.)	All Employees (1,000)	Value of Shipments ($ million)	Total Establishments (No.)	All Employees (1,000)	Value of Shipments ($ million)
1967	270	40.9	1,254.5	42	11.0	365.6	312	51.9	1,620.1
1966	NA	41.3	1,273.1	NA	9.6	311.4	NA	50.9	1,584.5
1965	NA	39.1	1,105.8	NA	7.6	220.6	NA	46.7	1,326.4
1964	NA	36.6	961.2	NA	7.2	196.1	NA	43.8	1,157.3
1963	272	36.3	868.9	34	6.3	165.1	306	42.6	1,034.0
1962	NA	40.9	928.8	NA	7.0	175.3	NA	47.9	1,104.1
1961	NA	39.5	789.1	NA	5.4	124.6	NA	44.9	913.7
1960	NA	41.0	854.8	NA	5.4	116.6	NA	46.4	971.4
1959	NA	40.8	873.3	NA	4.7	103.5	NA	45.5	976.8
1958	302	37.7	687.3	28	4.6	98.7	330	42.3	786.0

NA = Not available.

Source: U. S. Bureau of the Census, Census of Manufactures (1958, 1963, 1967) and Annual Survey of Manufactures (all other years).

The number of establishments engaged in the manufacture of iron and steel forgings declined from 302 in 1958 to 270 in 1967, and employment gained only slightly, from 37,700 to 40,900. Value of shipments increased from $687.3 million to $1,254.5 million, yielding an annual growth rate of nearly 7%.

In contrast, the number of plants producing nonferrous forgings rose from 28 to 42 in the 1958-1967 period, a 50% increase. Employment swelled from 4,600 to 11,000, and the value of shipments increased from $98.7 million to $365.6 million, a growth of about 15.6% a year.

Forging Industry Association Data. A more detailed breakdown of the forging market, by types of metal used and in terms of both dollars and net weight, is available from the Forging Industry Association for the years 1959 through 1968. (See Table 4.) However, these data represent commercial sales only and include only sales of closed die forgings, which constitute about 75% of the total for all types of processes. Commercial sales of closed die forgings increased from $636 million in 1959 to $1,067 million in 1968, a 68% gain in a nine-year period or 5.9% per year. In terms of net weight, shipments rose from 981,000 tons to 1,359,000 tons, a 38% total increase or 3.7% a year.

The breakdown in Table 4 also shows that sales of ferrous forgings rose from $476 million in 1959 to $729 million in 1968, those for nonferrous forgings from $118 million to $250 million, and those for high-temperature[1/] forgings from $42 million to $88 million. Gains in tonnage shipped during the same period were as follows: ferrous, from 934,000 to 1,262,000 tons; nonferrous, from 41,000 to 87,000 tons; and high-temperature, from 6,000 to 10,000 tons.

Between 1959 and 1968, sales of ferrous forgings increased 53% in dollar volume and 35% in net weight. The growth item in this category was stainless steel, with a 155% dollar increase and a 167% tonnage gain. Nonferrous forging sales grew 112% in both dollar volume and net weight, with aluminum the big gainer. The dollar and weight increases in high-temperature forging shipments were 109% and 67%, respectively. Details of the percentage increases in sales volume and the annual growth rates for each type of metal forging are given in Table 5.

1/ Alloys, based on either ferrous or nonferrous metals, which are used at temperatures of 1000°F.

Table 4

CLOSED IMPRESSION DIE FORGING SHIPMENTS IN THE UNITED STATES, 1959-1968

Year	Ferrous				Nonferrous					
	Carbon Steel	Common Alloy Steel	Stainless Steel	Total Ferrous	Aluminum	Titanium	Other Nonferrous[a]	Total Nonferrous	Total Hi-Temp[b]	Total
	Millions of Dollars									
1968	410	273	46	729	120	62	68	250	88	1,067
1967	371	298	45	714	136	70	53	259	87	1,060
1966	389	303	40	732	135	NA	100	235	83	1,050
1965	346	255	32	633	95	NA	86	181	66	880
1964	292	246	30	568	90	NA	77	167	60	795
1963	268	227	25	520	75	NA	62	137	57	714
1962	276	210	22	508	69	NA	68	137	53	698
1961	243	160	15	418	60	NA	61	121	50	589
1960	255	189	16	460	59	NA	61	120	46	626
1959	259	199	18	476	60	NA	58	118	42	636
	Thousands of Tons									
1968	860	386	16	1,262	46	4	37	87	10	1,359
1967	792	423	18	1,233	50	5	32	87	11	1,331
1966	845	457	14	1,316	51	NA	36	87	11	1,414
1965	779	412	11	1,202	39	NA	31	70	8	1,280
1964	663	387	10	1,060	34	NA	27	61	7	1,128
1963	618	347	9	974	27	NA	21	48	6	1,028
1962	647	327	8	982	22	NA	22	44	5	1,031
1961	560	241	5	806	19	NA	20	39	5	850
1960	586	285	6	877	19	NA	20	39	4	920
1959	614	314	6	934	20	NA	21	41	6	981

a/ Includes brass, copper, magnesium.

b/ Those alloys, whether iron-base, nickel-base, cobalt-base, or others, suitable for use at temperatures of 1000°F.

NA = Not available for 1966 and earlier years. In those years, titanium was included in nonferrous.

Source: Forging Industry Association, Cleveland, Ohio.

Table 5

PERCENT INCREASE IN SALES VOLUME AND ANNUAL GROWTH RATE BY TYPE OF METAL FORGING, UNITED STATES, 1959-1968

Type of Metal	Percent Increase		Annual Growth Rate in Percent	
	Dollar	Net Weight	Dollar	Net Weight
Carbon Steel	58	40	5.25	3.50
Common Alloy Steel	37	23	3.55	2.35
Stainless Steel	155	167	11.00	11.50
Total Ferrous	53	35	4.80	3.40
Aluminum	100	130	8.00	9.70
Titanium	NA	NA	NA	NA
Other Nonferrous	17	76	1.75	6.50
Total Nonferrous	112	112	8.70	8.40
Total Hi-Temp	109	67	8.50	4.90
Total Forgings	68	38	5.90	3.70

NA = Not available.

Source: Table 4.

Market Outlets by Forging Process

Between 1958 and 1968, shipments of closed die steel forgings increased from 824,000 tons to 1,550,000 tons, an 88% increase over the period or 6.5% annually, whereas shipments of open die forgings rose from 255,000 tons to 392,000 tons, a 54% total increase or 4.4% annually. Table 6 lists statistics on commercial shipments of steel forgings made by the closed die and open die processes as given in Current Industrial Reports, published by the U. S. Bureau of the Census. Nonferrous forgings are not included. Data on tonnage shipped are available from 1958 to 1968, while those on dollar volume date back only to 1963.

The combined shipments of closed die and open die forgings increased from 1,079,000 tons in 1958 to 1,942,000 tons in 1968, an 80% increase for the decade or 6% a year. During these years, shipments of closed die forgings ranged from 74% to 80% in tonnage of all forgings shipped; from 1963 to 1968, they comprised 68% to 81% in dollar volume. The lower percentage range in dollar value than in weight for closed die forgings indicates that open die forgings commanded a higher price in general.

Table 6

STEEL FORGINGS: COMMERCIAL SHIPMENTS OF CLOSED DIE AND OPEN DIE FORGINGS, UNITED STATES, 1958-1968

Year	Closed Die		Open Die		Total	
	1,000 Tons	Millions	1,000 Tons	Millions	1,000 Tons	Millions
1968	1,550	$886	392	$301	1,942	$1,187
1967	1,535	887	400	302	1,935	1,189
1966	1,650	908	421	292	2,071	1,200
1965	1,559	968	453	377	2,012	1,345
1964	1,350	847	409	203	1,759	1,050
1963	1,177	555	376	266	1,553	821
1962	1,147	NA	345	NA	1,492	NA
1961	879	NA	304	NA	1,183	NA
1960	953	NA	315	NA	1,268	NA
1959	1,065	NA	309	NA	1,374	NA
1958	824	NA	255	NA	1,079	NA

NA = Not available.

Source: U. S. Bureau of the Census, Current Industrial Reports, MA-33C.

Market Outlets by End Use

Major market outlets for closed die forgings by end use have been reported annually by the Forging Industry Association since 1959. Dollar sales by 16 major end uses from 1959 to 1968 are given in Table 7, and the percentage share of the total market represented by each end use is given in Table 8. Sales volume of the industry as a whole grew from $636 million in 1959 to over $1 billion in 1968.

In 1968, forging sales to the aircraft and missiles market constituted 31.6% of the total sales, those to the automotive industry 20.3%, ordnance 11.6%, and off-highway equipment 11.3%. These four major end uses constituted about three-quarters of the total forging sales. Forging consumption in several end-use markets increased significantly in terms of both dollar volume and percentage share between 1959 and 1968. They were machine tools, motors and generators, mechanical power transmission equipment, including bearings, off-highway

Table 7

CLOSED IMPRESSION DIE FORGING SALES BY MARKET OUTLETS AND ANNUAL GROWTH RATES, UNITED STATES, 1959-1968
(in thousands)

Major End-Use Market	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959	Percent Change 1959-1968	Annual Growth Rate
Agriculture	$ 35,513	$ 43,049	$ 47,264	$ 50,164	$ 49,301	$ 35,678	$ 34,213	$ 28,879	$ 30,079	$ 35,647	- 0.4	0.0
Aircraft and Missiles	337,428	363,899	343,453	263,140	232,190	238,330	239,490	183,295	204,288	298,542	+ 13.0	1.4
Automotive	216,385	194,567	202,711	206,815	172,553	159,124	154,307	133,198	147,889	143,861	+ 50.4	4.6
Internal Combustion Engines, Stationary	10,771	9,649	11,553	9,681	5,566	7,136	4,888	6,483	5,013	5,729	+ 88.0	6.8
Machine Tools	12,478	10,073	9,453	9,681	7,952	4,995	4,189	7,072	6,266	3,819	+ 226.7	13.5
Motorcycles, Bicycles, and Miscellaneous Equipment	-	3,711	4,201	3,520	3,976	3,568	3,491	4,715	3,760	3,819	-	0.0
Motors and Generators	7,359	4,559	4,201	6,161	6,361	4,281	3,491	2,357	4,386	1,910	+ 285.3	18.4
Mechanical Power Transmission Equipment, Including Bearings	14,717	12,830	13,654	11,441	12,723	8,563	9,077	6,483	8,773	5,729	+ 156.9	11.0
Off-Highway Equipment	120,190	126,707	136,541	107,368	105,758	84,200	81,692	70,725	78,958	59,836	+ 100.9	8.1
Ordnance (Except Missiles)	124,242	102,532	76,673	36,963	41,349	42,100	37,006	22,986	15,666	7,002	+1,674.4	89.1
Petrochemical	14,610	14,844	24,157	16,721	21,470	7,849	10,473	14,734	12,533	7,002	+ 108.7	8.5
Plumbing Fixtures, Valves, and Fittings	31,141	30,219	30,459	30,802	25,445	17,839	23,739	16,502	16,920	9,548	+ 226.1	14.1
Pumps and Compressors	10,238	10,285	8,403	4,400	2,385	3,568	2,793	4,126	2,507	2,546	+ 302.1	16.7
Railroad	28,474	29,583	28,359	28,162	27,036	19,266	22,343	31,237	23,186	18,460	+ 54.2	4.9
Refrigeration and Air-Conditioning	8,318	8,907	5,252	5,280	3,976	7,136	1,396	1,179	1,253	1,273	+ 553.4	23.2
Steam Engines and Turbines	10,451	6,044	5,252	4,400	5,566	6,422	3,491	4,126	4,386	2,546	+ 310.5	16.6
Other	84,144	88,854	98,730	85,366	71,566	63,507	62,142	51,276	60,786	29,281	+ 187.4	12.4
Total	$1,066,459	$1,060,312	$1,050,316	$880,065	$795,173	$713,562	$698,221	$589,373	$626,649	$636,550	+ 67.5	5.9

Source: Forging Industry Association, Cleveland, Ohio.

Table 8

PERCENT DISTRIBUTION OF CLOSED IMPRESSION DIE FORGING SALES BY MARKET OUTLETS, UNITED STATES, 1959-1968

Major End-Use Market	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959
Agriculture	3.3	4.0	4.5	5.7	6.2	5.0	4.9	4.9	4.8	5.6
Aircraft and Missiles	31.6	34.3	32.7	29.9	29.2	33.4	34.3	31.1	32.6	46.9
Automotive	20.3	18.4	19.3	23.5	21.7	22.3	22.1	22.6	23.6	22.6
Internal Combustion Engines, Stationary	1.0	0.9	1.1	1.1	0.7	1.0	0.7	1.1	0.8	0.9
Machine Tools	1.2	0.9	0.9	1.1	1.0	0.7	0.6	1.2	1.0	0.6
Motorcycles, Bicycles, and Miscellaneous Equipment	-	0.4	0.4	0.4	0.5	0.5	0.5	0.8	0.6	0.6
Motors and Generators	0.7	0.4	0.4	0.7	0.8	0.6	0.5	0.4	0.7	0.3
Mechanical Power Transmission Equipment, Including Bearings	1.4	1.2	1.3	1.3	1.6	1.2	1.3	1.1	1.4	0.9
Off-Highway Equipment	11.3	11.9	13.0	12.2	13.3	11.8	11.7	12.0	12.6	9.4
Ordnance (Except Missiles)	11.6	9.7	7.3	4.2	5.2	5.9	5.3	3.9	2.5	1.1
Petrochemical	1.4	1.4	2.3	1.9	2.7	1.1	1.5	2.5	2.0	1.1
Plumbing Fixtures, Valves, and Fittings	2.9	2.9	2.9	3.5	3.2	2.5	3.4	2.8	2.7	1.5
Pumps and Compressors	1.0	1.0	0.8	0.5	0.3	0.5	0.4	0.7	0.4	0.4
Railroad	2.7	2.8	2.7	3.2	3.4	2.7	3.2	5.3	3.7	2.9
Refrigeration and Air-Conditioning	0.8	0.8	0.5	0.6	0.5	1.0	0.2	0.2	0.2	0.2
Steam Engines and Turbines	1.0	0.6	0.5	0.5	0.7	0.9	0.5	0.7	0.7	0.4
Other	7.8	8.4	9.4	9.7	9.0	8.9	8.9	8.7	9.7	4.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Table 7.

equipment, ordnance, petrochemical industry, plumbing fixtures, pumps and compressors, refrigeration and air-conditioning, and steam engines and turbines.

The forging consumption pattern by end use is illustrated in terms of annual dollar volume, percentage share of the total market, percent gain between 1959 and 1968, and annual growth rate in Table 7 and Table 8. Forging sales to all market outlets with the exception of motorcycles, bicycles, and miscellaneous equipment exhibited an increasing trend. The failure of agricultural uses to register a gain between 1959 and 1968 is due to the use of a high beginning year and a low ending year. During the intervening years, the use of forgings in agriculture did show a tendency to increase. The extraordinary gain in the use of forgings by the ordnance industry obviously was caused by the rapid expansion of war efforts in Vietnam. As a rule, the pattern of forging shipments to each market outlet tends to fluctuate from year to year, generally following the economic trend of each end-use industry. However, most end uses show an overall rise in forging consumption.

The Outlook for the Forging Market

The market for forgings will continue to grow because of increasing demand for high-strength and stress-resistant parts for various machines and vehicles. However, the competition from other metallurgical processes is keen. Such products as castings, weldments, stampings, and powder metal parts are vying with forgings in the general area of metallurgy. The forging industry must compete successfully both on technical grounds and on economic terms in order to maintain the growth records of the past. To meet the competition, a search for technological innovations and new marketing approaches is necessary.

The distribution of forging facilities in the nation is an obvious drawback. These facilities are highly concentrated in some states and sparsely distributed in other regions. Unless forging facilities are added to meet the growing needs of a given region, these needs will be met by competing processes at the expense of forgings. For example, the increasing need for forgings in the Southeast cannot be met by regional supplies. This situation is discussed in detail in several succeeding sections of this report.

In order to give a rough idea of the growth potential of the forging industry, several projections were made based on past trends. The value of

shipments of iron and steel forgings (Table 3) is projected to reach $1,397.2 million in 1970 and $1,688.8 million in 1975. Shipments of nonferrous forgings are projected at $392.5 million in 1970 and $528.8 million in 1975. The combined shipments of ferrous and nonferrous forgings would increase from $1,620.1 million in 1967 to $1,789.7 million in 1970 and to $2,217.6 million in 1975. These statistics are given in Table 9.

Table 9

PROJECTED VALUE OF SHIPMENTS OF FERROUS AND NONFERROUS FORGINGS IN THE UNITED STATES, 1970 AND 1975
(in millions of dollars)

Year	Iron and Steel	Nonferrous	Total
1967	1,254.5	365.6	1,620.1
1970	1,397.2	392.5	1,789.7
1975	1,688.8	528.8	2,217.6

Projections also were made based on the tonnage data given by the Forging Industry Association on closed impression die forgings (Table 4). Ferrous forgings are projected to increase from 1,262,000 tons in 1968 to 1,408,000 tons in 1970 and 1,674,000 tons in 1975. Shipments of nonferrous and high-temperature forgings are projected to increase at higher rates. Among the ferrous forgings, shipments of stainless steel and alloy steel are projected to increase more rapidly than carbon steel. Detailed statistics are shown in Table 10.

Table 10

PROJECTED SHIPMENTS OF CLOSED IMPRESSION DIE FORGINGS BY METAL TYPE IN THE UNITED STATES, 1970 AND 1975
(in thousands of tons)

Year	Carbon Steel	Common Alloy Steel	Stainless Steel	Total Ferrous	Total Nonferrous	Total Hi-Temp
1968	860	386	16	1,262	87	10
1970	914	475	19	1,408	103	12
1975	1,081	566	27	1,674	135	16

THE FORGING MARKET IN THE SIX-STATE SOUTHEAST

A Market Survey

In November-December 1969, a mail survey was conducted to determine the size of the forging market in a six-state area in the Southeast -- Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee. Questionnaires were sent to 1,854 metalworking companies in the six states, representing over 60 four-digit metalworking industries as classified under the Standard Industrial Classification (SIC) system adopted by the U. S. Department of Commerce. These groupings ranged from motor vehicles and aircraft to ordnance and machine tools.

The questionnaire was designed to obtain information on type of manufacturing, number of employees, annual consumption of forgings by metal type and by process, percent of captive supplies, anticipated increase in forging consumption, principal supplying states, the effect of a nearby supply upon consumption, and annual purchases of castings, weldments, stampings, and powder metal parts. The questionnaire and covering letter are reproduced in the Appendix.

Responses to the survey totaled 1,067, a 58% return. The number of questionnaires sent out and the number of responses received from each state are given in Table 11. The table also gives a breakdown of the number of respondents who do or do not use forgings.

The forging market in the six-state area as a whole is discussed in the following section. Analysis of the forging market in each state is given in succeeding sections.

Forging Consumption in the Six-State Southeast

The consumption of forgings in the six-state area was estimated at $46 million in 1969, and annual growth was estimated at $4.6 million or about 10% a year. In the same year, an enumerated total of $31 million worth of forgings was consumed by 194 responding companies in the six states. These firms anticipated an increase in forging consumption of $3.3 million a year or about 11% annually. Table 12 presents two series of statistics; one is based on the enumerated total of 194 responding companies which reported using forgings,

Table 11

A FORGING SURVEY IN SIX STATES: NUMBER OF QUESTIONNAIRES SENT OUT, RESPONSES RECEIVED, AND RATE OF RESPONSE, 1969

State	Sent Out	Responses Received			Rate of Response
		Users of Forgings	Nonusers of Forgings	Total	
Alabama	274	35	106	141	51%
Florida	427	30	200	230	54
Georgia	311	31	163	194	62
North Carolina	355	37	162	199	56
South Carolina	149	18	73	91	61
Tennessee	338	43	169	212	63
Total	1,854	194	873	1,067	58%

and the other is the estimated total consumption of forgings in the six-state area. The estimated total is derived from the "enumerated total" plus a ratio estimate for nonresponding companies. The estimated total is believed to be on the conservative side because many responding companies indicated "use forgings sparingly" or "insignificant amount" without giving a specific volume either in dollars or in poundage; these companies were grouped in the "nonusers of forgings" category.

Of the estimated $46 million of forgings consumed, carbon steel constituted $19 million, alloy steel $16 million, and nonferrous $11 million. Closed impression die forgings comprised about 66% of the total and open die forgings about 34%. Captive supplies were estimated at $8 million or about 17% of the total forgings consumed in the area. Annual consumption of forgings plus their competing materials (castings, weldments, etc.) was estimated at $131 million or about 285% of forging consumption alone.

Of the enumerated $31,254,000 worth of forgings consumed by 194 companies, about $12 million was in carbon steel, nearly $11 million in alloy steel, and over $8 million in nonferrous. Captive supplies amounted to $5.7 million or about 18% of the total consumption. Closed impression die forgings constituted about two-thirds of the total and open die forgings one-third. Annual consumption of forgings and competing materials was nearly $90 million or about 287% of the total forging consumption.

Table 12

A SUMMARY OF FORGING CONSUMPTION IN THE SIX-STATE SOUTHEAST, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	194	-
Carbon Steel	Dollars	12,061,000	19,201,000
	Pounds	47,911,000	76,274,000
Alloy Steel	Dollars	10,749,000	15,767,000
	Pounds	19,371,000	27,153,000
Nonferrous	Dollars	8,444,000	11,173,000
	Pounds	6,458,000	8,790,000
Total Forgings	Dollars	31,254,000	46,141,000
	Pounds	73,740,000	112,217,000
Captive Supplies	Dollars	5,665,000	7,980,000
	Percent	18	17
Closed Die	Dollars	20,771,000	30,349,000
	Percent	66	66
Open Die	Dollars	10,483,000	15,792,000
	Percent	34	34
Anticipated Annual Increase	Dollars	3,299,000	4,574,000
	Percent	11	10
Annual Consumption of Forgings and Competing Materials	Dollars	89,816,000	131,469,000
	Percent[1/]	287	285

1/ Represents the percent of "total forgings."

Both the enumerated totals and estimated totals for "anticipated annual increase" and "annual consumption of forgings and competing materials" tend to be on the low side. Many responding companies using forgings did not answer these two questions. The enumerated totals given in Table 12 represent the sums of the responding companies' answers to specific questions.

Major end uses of forgings by responding companies in the six-state Southeast are grouped by Standard Industrial Classification in Table 13, which lists consumption in dollars and poundage. Eight two-digit SIC's and nine four-digit SIC's are listed. Of the two-digit end uses, fabricated metal products, machinery, and transportation equipment are the most important ones. Of the four-digit end uses, fabricated plate work (boiler shops), aircraft parts and auxiliary equipment, metal stampings, and farm machinery and equipment predominate.

Purchased forgings in the area came largely, in order of importance, from Ohio, California, Pennsylvania, Massachusetts, Indiana, Illinois, Tennessee, Alabama, and Michigan. There are other supplying states, but they shipped much smaller volumes.

Among 160 companies answering the question concerning possible increased consumption of forgings because of a new source of supply nearby, 41 gave affirmative answers and 119 responded negatively. This indicates that over one-fourth of the consuming companies would increase their forging purchases if a new forging plant were within easy reach.

Forging Consumption in Alabama

The estimated total consumption of forgings in Alabama in 1969 was about $12 million or about 26% of the six-state volume, based on an enumerated total from 35 respondents of $7 million. Of the total consumed, $9.2 million was in carbon steel, $1.5 million in alloy steel, and $1.5 million in nonferrous forgings. Closed impression die forgings constituted about 69% and open die forgings 31%. Captive supplies amounted to 12% of the total consumption. Annual consumption of forgings plus competing materials was estimated at $30.4 million or about 251% of the consumption of forgings alone. Detailed statistics for both the enumerated total of 35 respondents and the estimated total for the state are given in Table 14.

Major end uses of forgings by responding companies in Alabama are presented in Table 15. Among the six two-digit SIC's listed, ordnance and accessories,

Table 13

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES
IN THE SIX-STATE SOUTHEAST, 1969

SIC	Dollars	Pounds	End Uses
19	3,025,000	12,166,000	Ordnance and accessories
1911	1,170,000	5,580,000	Guns, howitzers, motors, and related equipment
1925	1,170,000	5,580,000	Guided missiles and space vehicles
25	3,000	4,000	Furniture and fixtures
33	1,162,000	1,688,000	Primary metal industries
34	10,418,000	24,460,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
3443	3,013,000	3,025,000	Fabricated plate work (boiler shops)
3461	2,213,000	7,652,000	Metal stampings
3499	1,115,000	1,350,000	Fabricated metal products, n.e.c.
35	7,287,000	19,692,000	Machinery, except electrical
3522	1,674,000	6,132,000	Farm machinery and equipment
36	1,729,000	1,112,000	Electrical machinery, equipment, and supplies
3679	1,103,000	723,000	Electronic components and accessories
37	7,273,000	14,216,000	Transportation equipment
3729	3,122,000	2,994,000	Aircraft parts and auxiliary equipment, n.e.c.
3714	1,488,000	3,460,000	Motor vehicle parts and accessories
38	343,000	269,000	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks

Table 14

A SUMMARY OF FORGING CONSUMPTION IN ALABAMA, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	35	-
Carbon Steel	Dollars	5,409,000	9,178,000
	Pounds	22,266,000	37,773,000
Alloy Steel	Dollars	870,000	1,475,000
	Pounds	630,000	1,073,000
Nonferrous	Dollars	866,000	1,471,000
	Pounds	385,000	655,000
Total Forgings	Dollars	7,145,000	12,124,000
	Pounds	23,281,000	39,501,000
Captive Supplies	Dollars	857,000	1,412,000
	Percent	12	12
Closed Die	Dollars	4,930,000	8,365,000
	Percent	69	69
Open Die	Dollars	2,215,000	3,759,000
	Percent	31	31
Anticipated Annual Increase	Dollars	857,000	1,455,000
	Percent	12	12
Annual Consumption of Forgings and Competing Materials	Dollars	17,919,000	30,430,000
	Percent[1/]	251	251

1/ Represents the percent of "total forgings."

Table 15

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES IN ALABAMA, 1969

SIC	Dollars	Pounds	End Uses
19	2,382,000	11,245,000	Ordnance and accessories
1911	1,170,000	5,580,000	Guns, howitzers, mortars, and related equipment
1925	1,170,000	5,580,000	Guided missiles and space vehicles, completely assembled
33	225,000	639,000	Primary metal industries
34	1,680,000	2,373,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
3443	1,574,000	1,998,000	Fabricated plate work (boiler shops)
35	2,094,000	7,426,000	Machinery, except electrical
36	247,500	118,000	Electrical machinery, equipment, and supplies
37	516,000	1,479,000	Transportation equipment

machinery, and fabricated metal products are the major ones. The three four-digit SIC's are fabricated plate work (boiler shops), guided missiles and space vehicles, and guns, howitzers, motors, and related equipment.

Purchased forgings used in Alabama came, in order of importance, from Wisconsin, Ohio, Pennsylvania, Illinois, Alabama, Georgia, California, Texas, and Michigan.

Among 26 responding companies in the state, nine indicated that they would increase their forging consumption if a new source of supply could be found nearby. This represents 35% of the respondents to this question.

Forging Consumption in Florida

Thirty responding companies in Florida used forgings in 1969. The total enumerated consumption was $4.7 million, and the estimated total was $8.8 million or about 19% of the six-state figure. Annual increase was estimated at 10% a year, and captive supplies constituted 6% of the total volume. Of the estimated total consumption, $1.7 million was in carbon steel, $4.1 million in

alloy steel, and $3.1 million in nonferrous forgings. Closed impression die forgings constituted 53% of the total consumed, while open die forgings amounted to 47%. Annual consumption of forgings plus competing materials was only 144% of the total forging consumption. Detailed statistics on both enumerated totals and estimated totals are given in Table 16.

Table 16

A SUMMARY OF FORGING CONSUMPTION IN FLORIDA, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	30	-
Carbon Steel	Dollars	907,000	1,683,000
	Pounds	1,924,000	3,575,000
Alloy Steel	Dollars	2,195,000	4,075,000
	Pounds	2,093,000	3,884,000
Nonferrous	Dollars	1,648,000	3,061,000
	Pounds	1,638,000	3,041,000
Total Forgings	Dollars	4,750,000	8,819,000
	Pounds	5,655,000	10,500,000
Captive Supplies	Dollars	299,000	558,000
	Percent	6	6
Closed Die	Dollars	2,518,000	4,674,000
	Percent	53	53
Open Die	Dollars	2,232,000	4,145,000
	Percent	47	47
Anticipated Annual Increase	Dollars	475,000	882,000
	Percent	10	10
Annual Consumption of Forgings and Competing Materials	Dollars	6,844,000	12,699,000
	Percent[1/]	144	144

1/ Represents the percent of "total forgings."

Table 17 shows major end uses of forgings in Florida. Among seven two-digit SIC's given, transportation equipment stands out as the most important outlet. Most of the volume used in this industry was in one four-digit segment -- aircraft parts and auxiliary equipment.

Table 17

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES IN FLORIDA, 1969

SIC	Dollars	Pounds	End Uses
19	605,000	813,000	Ordnance and accessories
33	933,000	1,038,000	Primary metal industries
34	268,000	465,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
35	661,000	734,000	Machinery, except electrical
36	69,000	32,000	Electrical machinery, equipment, and supplies
37	2,189,000	2,542,000	Transportation equipment
3729	2,025,000	2,081,000	Aircraft parts and auxiliary equipment, n.e.c.
38	26,000	30,000	Mechanical measuring and controlling instruments, except automatic temperature controls

Among 27 companies replying as to a possible increase in forging consumption because of a nearby new supply, seven responded affirmatively and 20 negatively.

Forgings used in Florida came largely from California, Pennsylvania, Massachusetts, Alabama, Florida, Indiana, New York, and Illinois.

Forging Consumption in Georgia

Forging consumption in Georgia in 1969 was estimated at close to $8 million or about 17% of that of the six-state Southeast. Based on 31 responding companies, enumerated total consumption was $6.4 million. Of the estimated total, $2.8 million was in carbon steel, $0.7 million in alloy steel, and $4.4 million in nonferrous forgings. The use of nonferrous forgings in Georgia is the highest in the Southeast because Lockheed-Georgia Company is the single largest forging-consuming unit in the six-state area.

Closed impression die forgings comprised about 88% of the total consumption and open die forgings 12%. Anticipated annual increase in forging consumption was between 17% and 20%, the highest growth rate in the six-state region. Captive supplies constituted about 7% to 9% of the total consumed. Estimated annual consumption of forgings and competing materials totaled about $18 million or about 228% of forging consumption alone. Data on forging consumption in Georgia are given in Table 18.

Table 18

A SUMMARY OF FORGING CONSUMPTION IN GEORGIA, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	31	-
Carbon Steel	Dollars	1,703,000	2,765,000
	Pounds	8,599,000	14,021,000
Alloy Steel	Dollars	462,000	715,000
	Pounds	913,000	1,462,000
Nonferrous	Dollars	4,235,000	4,418,000
	Pounds	3,389,000	3,684,000
Total Forgings	Dollars	6,400,000	7,898,000
	Pounds	12,901,000	19,167,000
Captive Supplies	Dollars	451,000	732,000
	Percent	7	9
Closed Die	Dollars	5,632,000	6,950,000
	Percent	88	88
Open Die	Dollars	768,000	948,000
	Percent	12	12
Anticipated Annual Increase	Dollars	1,306,000	1,372,000
	Percent	20	17
Annual Consumption of Forgings and Competing Materials	Dollars	14,587,000	18,007,000
	Percent 1/	228	228

1/ Represents the percent of "total forgings."

Major end uses of forgings by responding companies in Georgia are shown in Table 19. Transportation equipment and fabricated metal products dominate among the six two-digit SIC's given. Only four four-digit SIC's are listed -- fabricated plate work (boiler shops), aircraft parts and auxiliary equipment, aircraft, and passenger car bodies.

Table 19

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES IN GEORGIA, 1969

SIC	Dollars	Pounds	End Uses
19	38,000	108,000	Ordnance and accessories
34	1,491,000	3,570,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
3443	894,000	765,000	Fabricated plate work (boiler shops)
35	1,338,000	2,669,000	Machinery, except electrical
36	810,000	602,000	Electrical machinery, equipment, and supplies
37	2,659,000	5,829,000	Transportation equipment
3729	814,000	605,000	Aircraft parts and auxiliary equipment, n.e.c.
3721	808,000	597,000	Aircraft
3712	958,000	409,000	Passenger car bodies
38	65,000	120,000	Mechanical measuring and controlling instruments, except automatic temperature controls

Only five companies indicated that they would increase their forging consumption because of a nearby new source of supply, out of 27 firms responding to this question. Most of the forgings used in Georgia came from California, Ohio, Massachusetts, Georgia, Missouri, Indiana, Texas, Michigan, New York, and Wisconsin.

Forging Consumption in North Carolina

In 1969, an estimated $2.2 million worth of forgings was consumed in North Carolina, based on $1.4 million reported by 37 survey respondents. This was about 5% of the six-state total. Anticipated annual increase in forging consumption was 5%. No captive supplies were reported. Of the estimated total

consumed, $1.4 million was in carbon steel, $0.4 million in alloy steel, and $0.4 million in nonferrous forgings. Closed impression die forgings constituted about 75% of the total consumption, with the balance of 25% in open die forgings.

Combined annual consumption of forgings and competing materials was estimated at over $21 million or about 959% of the forgings consumed in the state. The large consumption of competing products, such as castings, weldments, stampings, and powder metal parts, may explain the small volume of forgings used in the state. Detailed statistics are given in Table 20.

Table 20

A SUMMARY OF FORGING CONSUMPTION IN NORTH CAROLINA, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	37	-
Carbon Steel	Dollars	871,000	1,425,000
	Pounds	3,393,000	5,561,000
Alloy Steel	Dollars	257,000	423,000
	Pounds	646,000	1,060,000
Nonferrous	Dollars	239,000	392,000
	Pounds	173,000	284,000
Total Forgings	Dollars	1,367,000	2,240,000
	Pounds	4,212,000	6,905,000
Captive Supplies	Dollars	0	0
	Percent	0	0
Closed Die	Dollars	1,025,000	1,680,000
	Percent	75	75
Open Die	Dollars	342,000	560,000
	Percent	25	25
Anticipated Annual Increase	Dollars	68,000	112,000
	Percent	5	5
Annual Consumption of Forging and Competing Materials	Dollars	13,115,000	21,482,000
	Percent 1/	959	959

1/ Represents the percent of "total forgings."

Major end uses of forgings by responding companies in North Carolina are given in Table 21. Of the seven two-digit SIC's listed, none exceeds $1 million. The most important outlets are machinery and fabricated metal products. Major supplying states are Pennsylvania, New York, Michigan, Massachusetts, Georgia, Ohio, Alabama, Indiana, and Connecticut. Ten companies out of 31 firms responding to this question indicated that they would increase their forging consumption because of a new source of supply nearby.

Table 21

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES IN NORTH CAROLINA, 1969

SIC	Dollars	Pounds	End Uses
25	3,000	4,000	Furniture and fixtures
33	4,000	12,000	Primary metal industries
34	273,000	893,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
35	765,000	2,841,000	Machinery, except electrical
36	9,000	6,000	Electrical machinery, equipment, and supplies
37	225,000	444,000	Transportation equipment
38	87,000	60,000	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks

Forging Consumption in South Carolina

The estimated volume of forgings consumed in South Carolina was $2.7 million in 1969, compared with an enumerated $2.2 million consumed by 18 responding companies. The consumption in the state constituted about 6% of the six-state total. Of the estimated total, $0.3 million was in carbon steel, $1.2 million in alloy steel, and $1.2 million in nonferrous forgings. About 47% were closed impression die forgings, and 53% were open die forgings. Captive supplies amounted to about 32% of the total. Forging consumption is anticipated to increase by 14% annually. The consumption of forgings and its competing materials in 1969 was nearly $4 million or about 146% of forging usage alone. Detailed statistics are given in Table 22.

Table 22

A SUMMARY OF FORGING CONSUMPTION IN SOUTH CAROLINA, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	18	-
Carbon Steel	Dollars	265,000	327,000
	Pounds	1,040,000	1,280,000
Alloy Steel	Dollars	1,004,000	1,233,000
	Pounds	2,072,000	2,545,000
Nonferrous	Dollars	958,000	1,179,000
	Pounds	371,000	441,000
Total Forgings	Dollars	2,227,000	2,739,000
	Pounds	3,483,000	4,266,000
Captive Supplies	Dollars	723,000	888,000
	Percent	32	32
Closed Die	Dollars	1,047,000	1,287,000
	Percent	47	47
Open Die	Dollars	1,180,000	1,452,000
	Percent	53	53
Anticipated Annual Increase	Dollars	312,000	383,000
	Percent	14	14
Annual Consumption of Forgings and Competing Materials	Dollars	3,252,000	3,999,000
	Percent[1/]	146	146

1/ Represents the percentage of "total forgings."

The most important outlet for forgings in South Carolina is the machinery industry, which uses a larger volume than the other three major outlets combined. Table 23 presents data on these end uses supplied by survey respondents.

All 16 respondents to a question concerning possible increased consumption of forgings because of a new supply source nearby gave negative answers.

Forging Consumption in Tennessee

Forging consumption in Tennessee in 1969 was estimated at $12.3 million or about 27% of the six-state total. Carbon steel forgings constituted about $3.8 million, alloy steel $7.8 million, and nonferrous only $0.6 million. Total usage by 43 survey respondents was $9.4 million. Tennessee leads the Southeast in forging consumption. However, it also leads the region in captive

Table 23

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES IN SOUTH CAROLINA, 1969

SIC	Dollars	Pounds	End Uses
34	385,000	98,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
35	1,335,000	2,599,000	Machinery, except electrical
36	382,000	77,000	Electrical machinery, equipment, and supplies
37	125,000	463,000	Transportation equipment

supplies -- 36% of total consumption. The anticipated annual increase in forging consumption was 3%, the lowest in the region.

Closed impression die forgings constituted about 60% of the total forgings consumed in Tennessee, while open die forgings amounted to 40%. Annual consumption of forgings together with its competing materials was estimated at $44.8 million in the state in 1969 or about 364% of the total forgings consumed. Detailed data in dollars and in poundage for both enumerated total and estimated total are given in Table 24.

Statistics on major end uses of forgings by responding companies in Tennessee are presented in Table 25. Among the five two-digit SIC's listed, fabricated metal products is by far the most important outlet; transportation equipment and machinery also are significant end uses. Only two four-digit SIC's are given -- metal stampings and motor vehicle parts and accessories.

Among 33 companies in Tennessee responding to a question concerning a possible increase in forging consumption if a new source of supply were located nearby, 10 replied in the affirmative and 23 in the negative. Forgings used in Tennessee came largely from Pennsylvania, Ohio, Illinois, California, Michigan, Tennessee, Mississippi, Wisconsin, New York, and New Jersey.

Table 24

A SUMMARY OF FORGING CONSUMPTION IN TENNESSEE, 1969

	Unit	Enumerated Total	Estimated Total
Companies	Number	43	-
Carbon Steel	Dollars	2,905,000	3,822,000
	Pounds	10,689,000	14,065,000
Alloy Steel	Dollars	5,961,000	7,845,000
	Pounds	13,018,000	17,130,000
Nonferrous	Dollars	498,000	654,000
	Pounds	565,000	746,000
Total Forgings	Dollars	9,364,000	12,321,000
	Pounds	24,272,000	31,941,000
Captive Supplies	Dollars	3,335,000	4,390,000
	Percent	36	36
Closed Die	Dollars	5,618,000	7,393,000
	Percent	60	60
Open Die	Dollars	3,746,000	4,928,000
	Percent	40	40
Anticipated Annual Increase	Dollars	281,000	370,000
	Percent	3	3
Annual Consumption of Forgings and Competing Materials	Dollars	34,099,000	44,850,000
	Percent[1/]	364	364

1/ Represents the percent of "total forgings."

Table 25

MAJOR END USES OF FORGINGS BY RESPONDING COMPANIES IN TENNESSEE, 1969

SIC	Dollars	Pounds	End Uses
34	6,320,000	17,059,000	Fabricated metal products, except ordnance, machinery, and transportation equipment
3461	2,023,000	7,082,000	Metal stampings
35	1,096,000	3,422,000	Machinery, except electrical
36	212,000	277,000	Electrical machinery, equipment, and supplies
37	1,558,000	3,458,000	Transportation equipment
3714	1,117,000	2,215,000	Motor vehicle parts and accessories
38	165,000	58,000	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks

THE NEED FOR ADDITIONAL FORGING FACILITIES IN THE SOUTHEAST

The Supply Deficit

The forging supply deficit in the six-state Southeast can be clearly illustrated by comparing the number of commercial forgers in the area, types of metal forged, and average maximum weight of a single forging with the counterpart figures for the United States. In the six-state area, there are seven commercial closed die forgers vs. 273 in the U. S., a ratio of 2.6%. However, only three metal categories or groups are forged in the area compared with eight categories over the nation. The largest difference is in the maximum weight of a single forging. In terms of carbon and low-alloy steel, the maximum weight in the six states is 26 pounds on the average vs. 2,664 pounds for the U. S. as a whole, a ratio of less than 1%. This ratio also applies to the two other types of metal forged in the area. Details are given in Table 26.

The status of open die forging facilities in the area is no better. Only two open die forgers are in the area vs. 113 in the U. S., a ratio of 1.8%. The two engage in only one category of metal forging, carbon and low-alloy steel, while eight categories are available in the U. S. Average maximum weight of a single forging in the area is 310 pounds vs. 22,488 pounds in the United States, a ratio of 1.38%. Details are given in Table 27.

The forging facilities in the six-state area are too few and too small to meet the regional demand for forgings. As verified in the survey presented in the previous sections, the major portion of the forgings consumed in the area has to be shipped in from other parts of the nation. The area consumed about $46 million worth of forgings in 1969, and annual growth is estimated at 10% to 11%. The gap between demand and supply will grow larger as time goes on because of the faster growth rate in the area than in the nation as a whole. If this growing market is not adequately served by the forging industry, competing metallurgical products such as castings and stampings will fill the gap.

The Growth of Metalworking Industries in the Six-State Southeast

The basis for the growth of the forging market in the six-state Southeast has been the growth of metalworking industries in the area. Between 1959 and 1967, employment in metalworking industries in the area more than doubled, reaching a total of nearly 500,000 workers in about 2,000 plants. This growth

Table 26

CLOSED IMPRESSION DIE FORGINGS IN THE SIX-STATE SOUTHEAST COMPARED WITH THE U. S. TOTAL: NUMBER OF COMPANIES, TYPES OF METAL FORGED, AND AVERAGE MAXIMUM WEIGHT OF A SINGLE FORGING, 1970

State	A		B		C		D		E		F		G		Z	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Alabama	1	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida	1	10	0	0	0	0	1	3	0	0	0	0	0	0	0	0
Georgia	1	30	1	30	0	0	0	0	0	0	0	0	0	0	0	0
North Carolina	1	6	1	2	0	0	0	0	0	0	0	0	0	0	0	0
Tennessee	3	17	1	11	0	0	1	11	0	0	0	0	0	0	0	0
Southeast	7	26	3	14	0	0	2	7	0	0	0	0	0	0	0	0
U. S.	176	2,664	111	2,300	67	688	58	1,072	9	590	40	1,436	35	1,779	1	100
Southeast as a % of U. S.	4.0	.98	2.7	.61	0	0	3.4	.65	0	0	0	0	0	0	0	0

A = Carbon and low-alloy steel
B = Stainless and high-alloy steel
C = Aluminum
D = Copper, brass, bronze
E = Magnesium
F = Titanium
G = Super alloys
Z = Zirconium

a = Number of companies.
b = Average maximum weight in pounds of a single forging.

Note: There are seven commercial closed die forging operations in the Southeast, compared with 273 in the U. S.

Source: Tabulated from data supplied by Precision Metal, Cleveland, Ohio.

Table 27

OPEN DIE FORGINGS IN THE SIX-STATE SOUTHEAST COMPARED WITH THE U. S. TOTAL: NUMBER OF COMPANIES, TYPES OF METAL FORGED, AND AVERAGE MAXIMUM WEIGHT OF A SINGLE FORGING, 1970

	A		B		C		D		E		F		G		Z	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Tennessee	2	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U. S.	98	22,488	71	11,863	22	3,844	29	2,000	7	3,143	22	4,812	24	4,284	1	100
Southeast as a % of U. S.	2.00	1.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A = Carbon and low-alloy steel
B = Stainless and high-alloy steel
C = Aluminum
D = Copper, brass, bronze
E = Magnesium
F = Titanium
G = Super alloys
Z = Zirconium

a = Number of companies.
b = Average maximum weight in pounds of a single forging.

Note: There are two commercial open die forgers in the Southeast, compared with 113 in the U. S.

Source: Tabulated from data supplied by Precision Metal, Cleveland, Ohio.

record far outstrips that of the U. S. as a whole -- metalworking employment in the area grew by 105% during the decade, or nearly three times the 39% metalworking employment increase recorded for the total U. S.

The metalworking industries for which these comparisons are drawn are listed in Table 28. The nine metalworking industries shown are a major factor in the U. S. economy, accounting for nearly one-half of the manufacturing sector. They spend 45% of all the money spent by manufacturing plants for materials, account for 45% of all capital expenditures, consume 40% of all purchased electrical energy, employ 49% of all industrial workers, and pay 55% of the total manufacturing payroll.[1/]

As shown in Table 28, all of the major metalworking industries except primary metals registered impressive gains in the six-state area during the

Table 28

NUMBER OF PLANTS AND EMPLOYMENT OF STEEL FABRICATING INDUSTRIES IN THE SIX SOUTHEASTERN STATES, 1957 AND 1967

	1967			1957		
		Employment			Employment	
Industries	No. of Plants	No.	% of U. S.	No. of Plants	No.	% of U. S.
Ordnance and Accessories	7	4,330	1.48	9	2,321	1.88
Metal Furniture	83	12,870	9.36	45	5,245	5.29
Primary Metals	212	66,730	5.04	153	63,860	5.43
Fabricated Metal Products	661	78,412	6.28	381	34,032	3.58
Machinery (Except Electrical)	491	74,597	4.28	295	32,373	2.79
Electrical Machinery and Equipment	223	95,504	5.52	95	29,325	2.89
Transportation	203	110,615	5.72	108	54,776	3.53
Instruments, Photo Equipment, Clocks	34	10,881	3.17	15	3,090	1.35
Miscellaneous Manufacturing Industries (Metal)	70	12,035	5.53	22	2,770	1.72
Total	1,984	465,974	5.19	1,123	227,792	3.52

Source: Metalworking Marketguide, Iron Age, 1957 and 1967.

1/ Metalworking Marketguide, Iron Age, Philadelphia, Pennsylvania, 1967.

1957-1967 period. The total number of plants increased from 1,123 in 1957 to 1,987 in 1967, while employment increased from 227,792 to 465,974. The increase for fabricated metal products, electrical and nonelectrical machinery, and transportation are most impressive because these industries already had a substantial base in 1957.

The area's metalworking employment, 5.19% of the U. S. in 1967, was comparable to the area's share of the forging market in the U. S. In contrast, the six-state area contains about 12.9% of the U. S. population, 11.6% of the U. S. nonagricultural employment, and 10.1% of total personal income. Although the area's metalworking complex cannot be expected to grow suddenly to 12.9% of the U. S. total -- the area's portion of U. S. population -- it can be expected to narrow the gap by growing more rapidly than the U. S. metalworking total. This has been the case in the recent past. As can be seen in Table 29, which shows percentage increases in employment for the nine major metalworking industries, all groups except ordnance and primary metals experienced much greater growth in the six states than in the United States between 1957 and

Table 29

PERCENTAGE INCREASES IN EMPLOYMENT OF STEEL FABRICATING INDUSTRIES IN THE UNITED STATES AND THE SIX SOUTHEASTERN STATES BETWEEN 1957 AND 1967

Industries	U. S.	Six States
Ordnance and Accessories	138	87
Metal Furniture	39	145
Primary Metals	13	4
Fabricated Metal Products	31	130
Machinery (Except Electrical)	50	130
Electric Machinery and Equipment	71	226
Transportation	25	102
Instruments, Photo Equipment, Clocks	50	252
Miscellaneous Manufacturing Industries (Metal)	35	334
Total (9 industries)	39	105

Source: Metalworking Marketguide, Iron Age, 1957 and 1967.

1967. The overall growth of the nine groups was 105%, or nearly three times the 39% growth record for the U. S.

The increase in forging consumption in the area should paralled the growth of the metalworking industries in the area. The Southeast has less than 1% of the U. S. forging industry's capacity. The need to strengthen local forging capability in order to meet the growing industrial needs of the area is obvious. It should be remembered that over one-fourth of the forging consumers contacted in the area indicated their intention to increase their purchases of forgings if a new supply source can be found nearby. This indicates that extra-regional suppliers cannot fulfill all regional requirements.

Georgia as a Location for New Forging Facilities

Georgia's central location in the Southeast enables the state to offer convenient, speedy delivery to the southeastern market. Atlanta is the center of commercial, transportation, and distributing activities in the Southeast and offers many conveniences in interregional contacts. Any new forging facilities located in Georgia would have major advantages in serving the Southeast. These advantages, such as closer coordination and consultation with forging users, shorter delivery time, freight savings, lower labor costs, and better choice in location, are briefly described.

The purchase of forgings requires considerable consultation between a buyer and a seller in order to reach agreement on the various requirements for a specific forged part, as mentioned previously. Proximity to customers would allow a significant improvement in services provided. In many instances, close coordination between buyer and seller could result in a better-quality product, lowered production cost, or both. Generally, the buyer and seller would share the benefits derived from this coordination. The six-state area would be a natural market for any Georgia-based forging plant.

One of Georgia's major assets in serving the southeastern market is its excellent statewide transportation network with Atlanta as the hub. First-morning delivery service is available from Atlanta to most of the six-state area on both carload and truckload shipments. One of the stimuli for this study was the complaints of several forging users in the area that they have had problems in slow delivery and poor services received from out-of-the-region suppliers. If a quality forging producer located in Georgia and

designated the six-state area as the major marketing area, many of these problems would be eliminated.

Transportation costs to the southeastern market are much lower from Georgia than from major forging-producing areas. The six-state area consumed about 112,217,000 pounds of forgings in 1969 or about 56,000 tons. Hundreds of thousands of dollars in transportation costs could be saved if a major portion of this tonnage were supplied by producers in the area.

The cost of labor in Georgia would compare favorably with any major forging-producing states, such as Ohio, Illinois, and Wisconsin. Labor advantages in the area also include less extensive fringe benefit requirements, more flexible job classification practices, and excellent labor-management relations. Georgia has had one of the lowest work stoppage rates in the nation over the years. In addition, an ample supply of labor has been one of the key factors in attracting new industries to Georgia. The state offers an extensive labor training program for new industries coming to Georgia through its 23 vocational-technical schools. These factors all lead to lower labor costs for a new forging plant in the state.

Georgia contains the largest land area in the territory east of the Mississippi River and thus has ample room for industrial expansion. Since location is important to a forging plant because of the heat and noise generated by such an operation, the ample industrial sites in the state provide an attractive array of choices. Assistance in site selection is available from area development commissions as well as several state-level development agencies.

APPENDIX

Survey Letter and Questionnaire

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE of TECHNOLOGY

Industrial Development Division

1132 W. Peachtree Street
Atlanta, Georgia 30309
873-2931 Area Code 404

Over the past several years, a number of groups have expressed an interest in generating in the Southeast additional forging facilities which could perform quality work. These new facilities have not materialized even though the rate of growth of metal fabricating industries in the region has been three times that of the nation as a whole. In order to ascertain the current need for new forging facilities in the Southeast and in the interest of regional development, we are surveying forging consumers in the region.

New facilities would give you a wider choice of forgings and eventually would cut down your costs and delivery time. Please take time to answer the few simple questions on the reverse side of this letter and return the questionnaire in the enclosed stamped, self-addressed envelope. We need your prompt reply even if you do not use forgings. All your answers will be kept in strict confidence.

Sincerely yours,

Tze I. Chiang
Senior Research Economist

TIC/mpc

QUESTIONNAIRE

FORGING CONSUMPTION

Principal Products _____

Number of Employees _____

1. Does your company use forgings? _____

2. What is your annual consumption of forgings in dollar and weight volumes?

Metal	Value	Poundage
Carbon steel	$_____	_____
Alloy steel (including stainless)	_____	_____
Nonferrous	_____	_____

3. What percent of the above is produced in your own company? _____

4. What is the approximate total amount of your consumption of forgings, castings, weldments, stampings, and powder metal parts in dollars?
$_____

5. What is the percent consumption by type of forging? Closed die_____
Open die_____

6. What increase in the use of forgings do you now contemplate? _____

7. From what principal states does your supply of purchased forgings come?

1. _____ 2. _____ 3. _____

8. Would additional forging facilities close to you affect your consumption?
_____ If "yes," to what extent? _____

Comments: _____

_____

_____

_____